Research Statement: What is the relationship between conscientiousness & intelligence?

Intelligence and achievement tests are some of the best predictors for adolescents of many adult outcomes. In the U.S., the ACT and SAT are heavily weighted in defining if and where a student attends college. The GRE is heavily weighted in defining admission to graduate school. Ultimately, these tests then are important contributors in defining who will have the opportunity to enter the scientific profession and who will not. Therefore, it is unsurprising that groups most apt to score poorly on these tests (*e.g.*, African Americans, women[1]), are ultimately underrepresented in science.

Tying test outcomes to admission decisions assumes that these tests measure meaningful (*i.e.*, reliable and valid) differences in intelligence. Yet, recent research suggests that these tests measure more than intelligence; Duckworth *et al.*[2] demonstrated that intelligence tests measure test-motivation as well. This finding suggests that the association between intelligence and important life outcomes may be systematically overestimated.

We need to consider motivation and its personality correlate, conscientiousness,[3] whenever we examine intelligence-outcome associations. Conscientiousness is characterized as the tendency to show self-discipline and aim for achievement.[4] Furthermore, we need to explore the full intelligence-conscien-tiousness relationship and its joint impact on life outcomes.

The zero-order correlation between conscientiousness and intelligence is negative,[5] even though the two predict many of the same important outcomes.[6] Moutafi has theorized that this negative relationship is because fluid intelligence affects the development of conscientiousness.[5] In competitive environments (*i.e.*, those with high stakes testing), "less intelligent individuals become more conscientious in order to cope with their disadvantage."[5] Because conscientiousness can compensate for lower levels of intelligence, conscientiousness can be thought of as an intelligence substitute. However, this relationship is imperfect, as some outcomes require high levels of intelligence that no amount of conscientiousness can overcome. By using the economic concept of substitution, we can systematically map how these two traits covary in predicting life outcomes.

Proposed Studies

Study 1: I propose testing this relationship on the two oldest and longest-running personality longitudinal studies: The Terman Gifted Study and The Kelly/Connolly Longitudinal Study (KCLS), using structural equation modeling. I will investigate how intelligence and conscientiousness mediate IQ's impact on four important life outcomes: *(1)* Divorce, *(2)* Health, *(3)* Income, and *(4)* Education. These four outcomes have established relationships with conscientiousness and intelligence.[6]

By testing the mediation model[7] (see fig. 1), I can examine how conscientiousness and intelligence covary across comparable cohorts. The sister studies' original investigators collaborated, ensuring their measures were comparable. Both studies included multiple measures of intelligence and conscientiousness, allowing for latent estimates of each variable. I have full access to all the relevant variables from both studies, and am familiar with both from my research experiences as an undergraduate.[8]

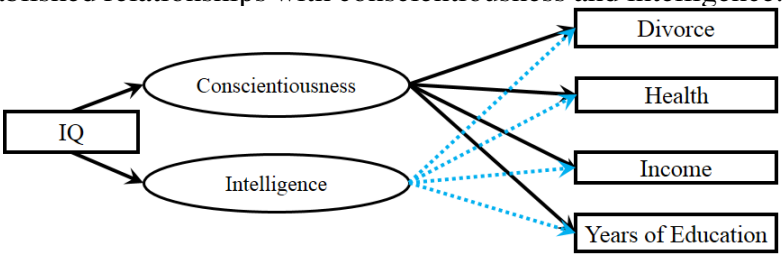

Figure 1: Hypothesized Model

Furthermore, I can test the non-linear relationship by exploiting the systematic difference between the sister studies. The Terman included participants with IQs $\geq$ 135, whereas the KCLS par-

ticipants' IQs ranged from 77 to 145^{+}. Any systematic difference between the models would provide support for a non-linear intelligence-conscientiousness relationship. I predict that there will be a modified threshold effect – conscientiousness will be more influential than intelligence at higher levels of intelligence, which will be reflected by increased effect sizes for the conscientiousness-outcome correlations or decreased effect sizes for the intelligence-outcome correlations.

Study 2: I will replicate and expand upon the hypothesized model using two representative, modern samples: (1) the National Longitudinal Survey of Youth (NLSY79), which includes a coding speed subtest, established as a valid proxy for conscientiousness;[9] and (2) the NLSY97, which includes self-report personality items of conscientiousness. In addition to examining the Study 1 outcomes, I will test how the intelligence- conscientiousness model mediates the relationships between high school GPA, college enrollment, and subsequent graduation. I will make special efforts to test the impoverished youths and racial minorities. I am familiar with the NLSY from my early research as a graduate student.[10]

This analysis will evaluate whether this model generalizes across multiple generations and diverse populations. Furthermore, this analysis will demonstrate whether the intelligence- conscientiousness relationship holds for more immediate life outcomes. I hypothesize that the model will hold across generations, but that IQ will account for less variance among the impoverished youths and racial minorities. The literature in this area mixed and focuses primarily on achievement tests rather than intelligence tests.[11]

Resources: At Vanderbilt, I have access to supportive methodological authorities in mediation analysis and structural equation modeling. Vanderbilt is also home to experts in intelligence research. My research collaborations in Vanderbilt's economics department and Washington University's psychology department will provide further expertise in conscientiousness.

Merit & Impact

My research will fill a void in the individual differences literature. The results will provide us with a model for jointly linking intelligence and conscientiousness to long and short life outcomes. Such a joint model has numerous future directions and applications. Once the joint intelligence-conscientiousness model is better understood, we can develop intelligence tests that explicitly identify intelligence and conscientiousness subscales. We can better identify high potential children with poor test scores. Early identification could improve participation of women and underrepresented minorities in science. We can also use the model to understand under what circumstances conscientiousness change occurs naturally and how to induce it artificially.

I am particularly interested in piloting experimental interventions with Vanderbilt's Program for Talented Youth. I am already involved with the organization; I hope to complement their sports statistic course with one that encourages female enrollment. I have also proposed presenting a psychology statistics workshop at TWISTER, a Tennessee organization that encourages high school girls to enter science and math professions. I believe strongly that efforts to sparking young womens scientific interests are essential for increasing the number of women in the profession. I hope that my efforts will encourage more scientific diversity, while my research will provide insight for identifying and developing the next generation of potential scientists.

Refs: **(1)** ETS, (2013). **(2)** Duckworth *et al*. (2011). PNAS, 108(19). **(3)** Judge & Ilies, (2002). *J. Applied Psych., 87*(4). **(4)** Roberts *et al*. (2005). *Person. Psych., 58*(1). **(5)** Moutafi *et al*. (2004) *Pers Indiv Differ*, 37(5). **(6)** Roberts, *et al*. (2007). *Persp Psych Sci, 2*(4). **(7)** MacKinnon (2008). CRC. **(8)** Garrison, *et al*. (2014 Feb). Poster to be presented at SPSP. **(9)** Segal, (2006). (w1124). *U. Pompeu Fabra*, Spain. **(10)** Garrison & Rodgers (2013) Poster submitted. **(11)** Fleming, (2002). *Rev. of Higher Ed. 25*(3)